



EFFECT OF PERIODONTAL THERAPY ON PREGNANCY OUTCOME IN WOMEN SUFFERING FROM CHRONIC PERIODONTITIS- A PROSPECTIVE CASE-CONTROL STUDY

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ABSTRACT

Background: Recent studies have shown periodontal diseases as risk factors for adverse pregnancy outcomes, such as preterm births and low birth weight.

Aim: The present study was designed to determine the effect of non-surgical periodontal therapy on pregnancy outcomes, in women with periodontitis and to detect IgM status in cord blood during delivery.

Design, Materials & Methods: 100 pregnant women with chronic generalized periodontitis in their 2nd trimester were selected and recruited for the study. They were grouped in to two: Treatment group Non-Treatment group. Periodontal parameters of all the subjects were recorded at baseline and after delivery. Data related to weight of infant and type of delivery was recorded. During the delivery, cord blood was collected for the estimation of IgM antibodies. All the recordings were subjected for statistical analysis.

Results and Conclusion: The results of the present study evidenced association between maternal periodontitis and adverse pregnancy outcomes.

KEY WORDS: chronic periodontitis, adverse pregnancy outcomes, preterm birth, low birth weight, maternal infections, non surgical periodontal therapy.

INTRODUCTION:

Periodontal diseases are group of diseases initiated by several bacteria which serves as reservoirs in production of pro-inflammatory cytokines and targets placental membranes via blood stream, pointing fetal exposure to blood-borne infections.^[1,2,3]

According to studies of Tarannum F et al^[4,5] and Page RC,^[6] the non surgical periodontal therapy decreases the levels of pro-inflammatory cytokines and adverse pregnancy outcomes.

Hence the present study was attempted to associate chronic periodontitis with pregnancy-outcomes, effect of non surgical periodontal therapy on pregnancy outcome in pregnant ladies with chronic periodontitis and to evaluate IgM levels in cord blood and correlate with the periodontal infections.

MATERIALS AND METHOD:

This study was designed and conducted by the Department of Periodontology, Narayana dental college, Chinthareddy palem, Nellore, India. Narayana dental college is located in Nellore, is in a very big campus comprising of medical college and hospital, Advanced Research Centre along with paramedical colleges like physiotherapy, nursing, yoga and naturopathy, well stocked library, laboratory, and clinical dental departments.

The subjects for the study were recruited from Jubilee Govt. Mother and Child hospital, Nellore, AP, India. The nature, design and aim of the study were explained to all the participants and consent letter was obtained prior to the start of the study. Ethical approval for the study was obtained from the institutional ethical review board, Narayana dental college and hospital, Nellore.

Study design: Inclusion criteria- A total of 101 healthy pregnant women age ranging 18-35 years who were in 2nd trimester with single gestation with chronic periodontitis and did not receive any periodontal treatment for the last six months were included in the study.

Exclusion criteria-Subjects with systemic diseases and history of tobacco, alcohol, medications were excluded from the study.

Demographic factors such as age, occupation, marital status, information on known risk factors and obstetric factors were obtained. Women who agreed to take periodontal treatment in their 2nd trimester were included in treatment group and those who received periodontal treatment after delivery were included in control group.

Clinical parameters including oral hygiene index simplified (OHI-S), bleeding index (BI), probing depth (PD) and clinical attachment level (CAL) were recorded at baseline and after delivery using sterile mouth mirror and William's periodontal probe.

All the subjects in treatment group received non-surgical periodontal therapy including scaling and root planning and oral hygiene instructions, whereas control group received only oral hygiene instructions during the study period. Periodontal therapy was given after delivery to the subjects in control group

Oral hygiene was assessed by using the OHI-S index (Greene and Vermillion, 1964). Bleeding was assessed by using the Sulcus bleeding index (Muhlemann and Son 1971). Pocket depth ≥ 4 mm was recorded using Williams probe and CAL was estimated as distance from cemento-enamel junction to the base of the pocket.

Pregnancy outcome information included birth weight of newborns and type of delivery like normal or preterm birth. Pre-term birth was defined as delivery at ≤ 37 weeks of gestation, normal birth at ≥ 37 weeks of gestation. Newborns with weight of $\leq 2,500$ grams were considered as Low birth weight. All the cord blood samples were obtained immediately after delivery and were tested for IgM levels.

Collections of 10 ml of mixed arterial and venous cord blood from the fetal side of umbilical cord was done in sterile aliquots and were transported to the laboratory in ice packs for biochemical analysis. IgM levels in the cord blood were estimated as an inflammatory marker using ELISA (Catalogue No: 1806), in order to evaluate the spread of maternal infection to the uterine cavity. Periodontal parameters for all the subjects were recorded after 2 days postpartum.

Reproducibility trials were performed prior to the study. The investigator was trained and calibrated for data recording in the Department of Periodontology, Narayana Dental College and Hospital. The training was continued till the examiner produced consistent observations. The intra-examiner kappa statistic scores were calculated for OHI-S, BI, PD and CAL indices, which were 0.78, 0.82, 0.86 and 0.84 respectively. All the measurements were carried out by a single periodontist.

Data analysis was carried out using the Statistical Package for Social Sciences (SPSS version 20). Basic descriptives were presented in the form of mean and standard deviation. Shapiro-Wilks Normality test results showed that all periodontal parameters in both the groups follow the normal distribution. Therefore, parametric methods were applied for the analysis of the data. Pair wise comparison of periodontal parameters were analyzed using paired 't' test. IgM levels between groups do not follow the normal distribution i.e Skewed. Therefore, non parametric methods were applied for the analysis of the data. Comparisons between groups were analyzed by Mann Whitney 'U' test. Basic descriptions were presented in the form of mean and standard deviation. The level of significance was set at $p < 0.05$ for all tests.

RESULTS:

Periodontal parameters among treatment and non-treatment groups were evaluated.

ated. Comparison of OHI-S, bleeding index, pocket depth and clinical attachment level in both groups after delivery revealed that there was statistically significant ($P < 0.001$) improvement was observed in treatment group with respect to all the clinical parameters except clinical attachment level ($P = 0.06$) and in non-treatment group statistically significant ($P = 0.001$) difference was observed with respect to OHI-S, BI and PD. Whereas CAL did not show any significant difference at baseline and after delivery ($P = 0.727$) as shown in Table 1.

Table-1: Overall comparison of periodontal parameters among treatment and Non-treatment groups.

Parameters	Treatment Group	Non-treatment Group	P Value
OHI-S			
Baseline	4.77 ± 0.71	4.43 ± 0.71	0.01*
After Delivery	4.40 ± 0.49	3.97 ± 1.04	0.003*
P Value	< 0.001*	0.001*	
BI			
Baseline	4.07 ± 0.74	4.31 ± 0.80	0.12**
After Delivery	3.17 ± 1.18	4.05 ± 0.96	0.047*
P Value	< 0.001*	0.001*	
PD			
Baseline	5.86 ± 1.07	4.74 ± 0.63	0.001*
After Delivery	2.93 ± 0.53	4.37 ± 0.78	0.003*
P Value	< 0.001*	0.04*	
CAL			
Baseline	4.92 ± 0.59	4.23 ± 0.76	0.001*
After Delivery	4.51 ± 0.59	4.20 ± 0.52	0.109**
P Value	0.06**	0.727**	

Independent Sample't' test, * $P < 0.05$ (Significant), ** $p > 0.05$ (Not significant)

Analysis of data for IgM levels showed that there was no statistically significant difference was observed between treatment and non-treatment groups ($p = 0.06$) as shown in Table 2.

Table-2: Comparison of IgM levels between the groups during delivery

Groups	IgM levels (mg/dl)	p-value
Treatment Group	96.49	0.06**
Non-treatment Group	99.00	

Chi-square Test, * $P < 0.05$ (Significant), ** $p > 0.05$ (Not significant)

Overall comparison of pregnancy outcomes between two groups was done. The maximum percentage (80%) of normal births were reported in treatment group compared to other outcomes and the results were significant ($P < 0.001$). In non-treatment group maximum percentage of outcomes are normal birth (48%) followed by low birth weights (34%) and the results were significant ($P = 0.034$) was observed as shown in Table 3.

Table-3: Comparison of pregnancy outcome between the groups

Groups	Treatment Group		Non-treatment Group	
	Frequency	Percentage	Frequency	Percentage
Low birth weights	6	11.8%	17	34%
Preterm births	4	7.8%	9	18%
Normal births	41	80%	24	48%
P Value	< 0.001*		0.034*	
Chi-square value	50.94		6.760	

Chi-square Test, * $P < 0.05$ (Significant), ** $p > 0.05$ (Not significant)

DISCUSSION:

Since periodontitis being an inflammatory disease and is believed to be one of the established individual risk factors for adverse pregnancy outcomes,^[7] the objective of the current study was whether the periodontal therapy aimed at reducing the microbial load, would have effect on these adverse pregnancy outcomes and might alter the IgM levels in cord blood.

In the present study, pregnant women were selected and assigned in to Treatment group (subjects receiving nonsurgical periodontal therapy including scaling, root planning and oral hygiene instructions) and NonTreatment group (subjects receiving only oral hygiene instructions), equalizing periodontal disease as relevant variable.

The maternal age, gestational age and periodontal parameters in both the groups did not show any significant difference showing similarities in all the characteristics of the subjects registered for the study.

Significant difference was found in pregnancy outcomes in both the groups. In accordance with results of many other studies the present study showed high incidence of PTLBW in group-2 eliciting an association between periodontal disease and adverse maternal outcomes.^[11,24,5,8,9,10,11,12,13] Many studies have proposed that periodontal disease is a chronic source of infection that have a deleterious effect on fetus leading to an early delivery.^[3]

The effect of periodontal inflammation on pregnancy outcomes may be explained by the following mechanisms. First, women with periodontal disease may experience frequent bacteraemia, as a result the uterine cavity may become exposed to or colonized by periodontal bacteria or their products (lipopolysaccharides) and may elicit an inflammatory cascade leading to preterm labor.^[14]

Second mechanism, the cytokines generated within the diseased periodontal tissues may enter the circulation and precipitate a similar cascade, leading to the spontaneous preterm labor and birth.^[15,16]

Although Ageuda A et al.^[17] found modest association between the periodontitis and adverse pregnancy outcomes, several other studies have failed to show such an association. Many studies reported no association between periodontitis and pregnancy outcomes^[18,19,20,21] which could be attributed to the use of partial mouth periodontal examination which might have underestimated the level of disease showing a negative association.

On evaluation of mean periodontal parameters highly significant reduction was observed in both the groups after delivery, except for clinical attachment level suggesting less periodontal destruction in treatment group. Treatment group showed maximum percentage (80%) of normal births compared to non-treatment group. The present findings indicated that the periodontal therapy may be useful in reducing the occurrence of low birth weight and preterm births. These results corroborate with Lopez NJ et al. (2002), Issac SGF et al. (2010), Offenbacher S et al. (2006), Moneet Walia, Navdeep Saini (2015).^[3,22,23,24]

Whereas our results are in contrast to, Jeffcoat MK et al.^[25] & Wimmer G et al.^[18] who reported an insufficient evidence to support the provision of periodontal treatment during pregnancy to reduce the adverse pregnancy outcomes.

Michalowicz BS et al., stated that nonsurgical periodontal treatment did not decrease the adverse pregnancy outcomes.^[15,26] They used attachment loss greater than 2mm as criteria for the diagnosis of periodontitis which might have contributed the value of final association in their results.

On biochemical analysis, IgM levels in the cord blood were found to be significantly higher in non-treatment group, suggesting that presence of intrauterine inflammation reflects the in-utero activation of the fetal immune response by bacterial antigens of oral origin. By this, the maternal periodontal infection is associated with systemic dissemination of oral organisms that translocate to the fetus in the absence of antibodies. This is in consistent with the results of Madionas PN et al.,^[27] who examined the prevalence of various periodontal bacteria along with the maternal and fetal antibody response. They concluded that there was a higher rate of preterm deliveries among mothers without a protective immunoglobulin IgG response against the bacteria of the red cluster.

Whereas Cappelli D et al.^[28] found increased levels of CRP, IL-1 α , TNF- β , PGE2 & IgM against periodontal pathogens (*C. rectus*, *P. nigresence*, *P. intermedia* & *F. nucleatum*) and suggested that risk of premature birth may increase when the fetus is exposed to periodontal bacteria.

The findings of the present study were interpreted to support the contribution of potential oral microbial flora to maternal- fetal infections and would suggest that an individual variation in maternal responses may enhance the susceptibility to adverse pregnancy outcomes. This is in consistent with Heather J et al.^[10] Whereas, Jeffrey LE et al.^[28] could not show significant levels of IgG antibodies to periodontal pathogens and concluded that during pregnancy the antibody levels to these pathogens were not associated with the birth outcome.

The present study showed a reduction in IgM antibody levels after non surgical periodontal treatment, this could be attributed to reduced antigenic load. D'Aiuto F et al.^[29] found decreased levels of IL-6 in patients treated with scaling and root planing.

CONCLUSION:

The present study states that, greater the severity of periodontitis, greater the elevation of serum IgM antibody concentration, which might have contributed to the risk for adverse pregnancy outcomes. Also the non-surgical periodontal therapy was coupled with positive responses to the therapeutic intervention in relation to pregnancy outcome and antigenic response. In conclusion of the study suggested clinicians to include oral health condition of a pregnant woman with other risk factors in to consideration during antenatal care.

Declaration of interest: All authors have no conflicts of interest to declare.

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